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Notes on some Japanese smut fungi. 5. *Anthracoidea blepharicarpae* and *A. dispalatae,* spp. nov.

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Abstract — Two new smut fungi, *Anthracoidea blepharicarpae* on *Carex blepharicarpa* and *A. dispalatae* on *Carex dispalata,* are described and illustrated from Japan.

Key words — *Anthracoideaceae,* taxonomy, *Ustilaginomycetes*

Introduction

During a taxonomic revision of the genus *Anthracoidea* in Japan, we found a specimen of a verruculose-spored species with relatively large spores on *Carex blepharicarpa.* After comparison with the known species of *Anthracoidea* on *Carex* sect. *Mitratae,* we consider this fungus new. The host of another Japanese specimen, originally identified as *Anthracoidea caricis* on *Carex* sp., was found to represent *Carex dispalata,* which is a member of the sect. *Anomalae.* Species of *Anthracoidea* have been considered by Vánky (1979) to be restricted to host plants belonging to the same or closely related sections of *Carex.* As no species of *Anthracoidea* has previously been reported on a representative of *Carex* sect. *Anomalae,* we propose a new species for this collection.

Material & methods

Material from the mycological collections the Graduate School of Life and Environmental Sciences, University of Tsukuba, Tsukuba (TSH), and Faculty of Agriculture, Hokkaido University, Sapporo (SAPA), was examined under the light (LM) and scanning electron (SEM) microscopes. For LM observations, spores were mounted in lactophenol solution on glass slides, gently heated to boiling point, and then cooled.

Spore measurements are given in the form: min–max (mean ± 1 standard deviation). For SEM, spores were attached to specimen holders by double-sided adhesive tape and coated with gold with an ion sputter. The surface structure of spores was observed at 10 kV and photographed with a JEOL SM-6390 scanning electron microscope.

Taxonomy

Anthracoidea blepharicarpae Denchev, T. Denchev & Kakish., **sp. nov.** Figs 1–2

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Sori in ovariis in inflorescentia dispersi, sicut corpora ellipsoidea vel basi cuneata, nigra, 3–4 mm longa, in superficie pulverei. Sporae a fronte visus late ellipticae, irregulares vel angulares, 18–30 × 14–25 (24.4±2.1 × 20.7±1.8) µm, a latere visus 12.5–15 µm, rufobrunneae vel atro-rufobrunneae; paries inaequaliter incrassatus, 1–3 µm crassus, plerumque 1–3 (–5) gibberis internis, et interdum etiam maculis lucem refringentibus; superficie verruculosa.

Holotypus *in matrice* Carex blepharicarpa *Franch.: JAPONIA, Hokkaido, Otaru (Ishikari Prov.), Mt. Tengu, 19.VI.1932, leg. Otani, Yabe, Takee & Murayama (SAPA, sine num.).*

Etymology: the name refers to the host species.

Sori in ovaries, scattered in the inflorescence, as ellipsoidal or cuneate at base, black, hard bodies, 3–4 mm long, when young covered by a thin membrane, later becoming exposed; spore mass of the mature sori powdery on the surface. Spores flattened, in plane view broadly elliptical, irregular or moderately angular in outline, sometimes elliptical or oval, in plane view 18–30 × 14–25 (24.4±2.1 × 20.7±1.8) µm (n = 150), as an exception up to 34 µm long, in side view 12.5–15 µm thick, middle to dark reddish brown, wall unevenly thickened, 1–3 µm thick, thickest at the angles, with 1–3 (–5) internal swellings, sometimes with light-refractive spots; verruculose. Spore germination unknown.

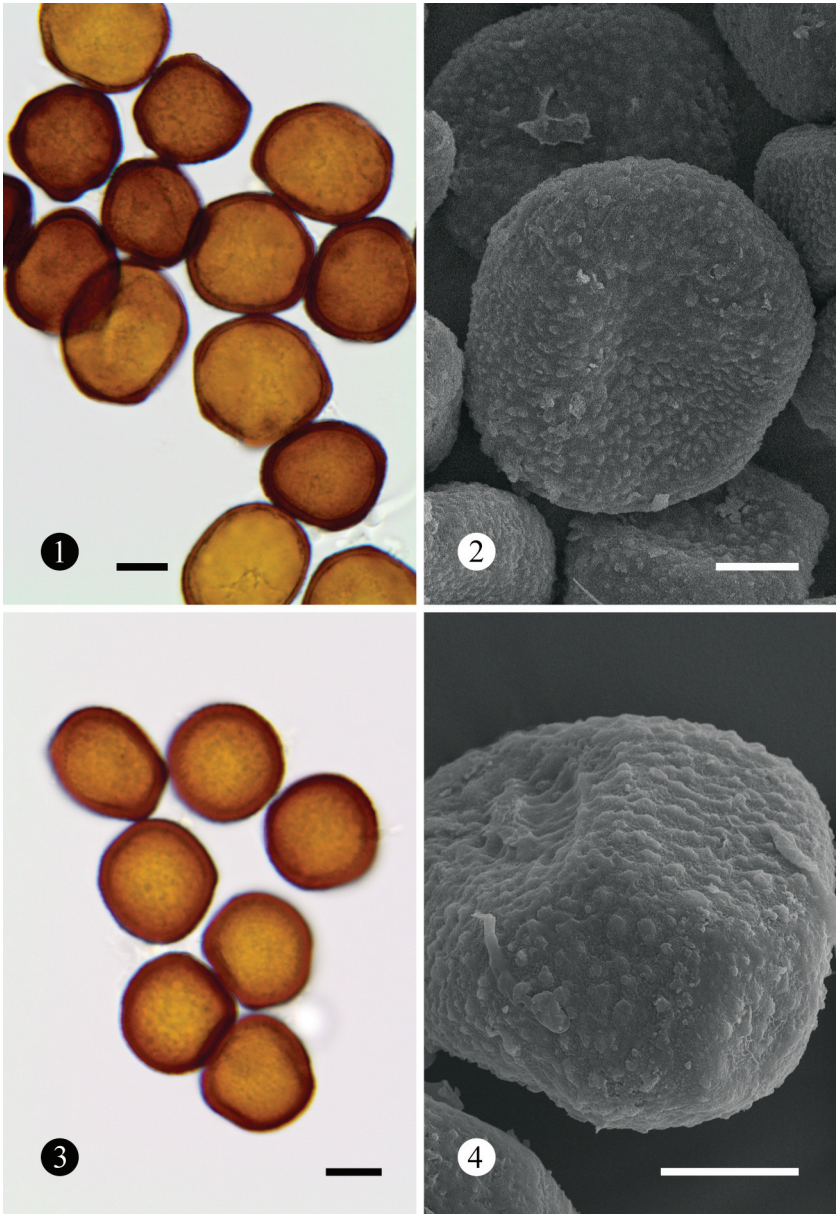
Distribution — On *Cyperaceae: Carex* – subgen. *Carex,* sect. *Mitratae: C. blepharicarpa,* Asia (Japan – Hokkaido).

Comments — *Carex blepharicarpa* is an eastern Asian species distributed in Japan, Korea, Kuril Islands, and Sakhalin Island.

Anthracoidea blepharicarpae differs from the two other members of *Anthracoidea* on sedges of sect. *Mitratae, A. microsora* (Syd.) Kukkonen and *A. caryophylleae* Kukkonen, in having larger spores.

The mean values of the spore length of 17 Japanese specimens of *A. microsora* as measured by us fell into a range of 18.8–20.7 µm. The mean value of the spore length of these specimens was 19.6±1.7 µm.

The mean values of the spore length of 18 eastern Asian specimens of *A. caryophylleae* (14 Japanese, two Korean, and two from the Sakhalin Island) as measured by us fell into a range of 18.6–21.7 µm. The mean value of the spore length of these specimens was 20.4±1.7 µm. Both mean values of the spore length of *A. microsora* and *A. caryophylleae* differed significantly from the respective mean of 24.4±2.1 µm for *A. blepharicarpae.*



Figs 1–2. Spores of *Anthracoidea blepharicarpae* on *Carex blepharicarpa* in LM and SEM (Holotype). Figs 3–4. Spores of *Anthracoidea dispalatae* on *Carex dispalata* in LM and SEM (Holotype). Scale bars: 1, 3 = 10 μm; 2, 4 = 5 μm.

Anthracoidea caryophylleae is a species originally described from Europe (Finland, Kukkonen 1963), where it is a common species (especially in Central and East Europe, and the Balkan Peninsula). The mean values of the spore length of European specimens were in a range of 16.9–20.5 µm (Kukkonen 1963: 18, Nannfeldt 1979, Vánky 1979: 229, Scholz & Scholz 1988, Denchev 2001) (cfr with the above noted range of 18.6–21.7 µm). It seems that the spores of the European specimens of *A. caryophylleae* are shorter than those of the eastern Asian specimens.

Key to the *Anthracoidea* species on subgen. *Carex* sect. *Mitratae*

1 Spores 18–30 (–34) µm long, spore mean length more than 22.5 µm ..... ***A. blepharicarpae***

1* Spores 15–25 (–27.5) µm long, spore mean length less than 22.0 µm **2**

2 Spores finely verruculose, warts up to 0.3 µm high; profile smooth or nearly so ..... ***A. caryophylleae***

2* Spores verruculose to verrucose, warts 0.2–0.6 µm high, affecting the spore profile ..... ***A. microsora***

Anthracoidea dispalatae Denchev, T. Denchev & Kakish., **sp. nov.** Figs 3–4

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Sori in ovariis in inflorescentia dispersi, sicut corpora subglobosa vel ovoidea, nigra, 1.8–2 mm longa, in superficie pulverei. Sporae a fronte visus irregulares, interdum suborbiculares vel late ellipticae, 19–26 × 16.5–23 (22.3±1.5 × 19.3±1.5) µm, a latere visus 11.5–14 µm, rufobrunneae vel atro-rufobrunneae; paries inaequaliter incrassatus, 1.5–2.5 (–3.3) µm crassus, plerumque sine gibberis internis, interdum 1 gibba interna, sine maculis lucem refringentibus; superficie verruculosa.

Holotypus *in matrice* Carex dispalata *Boott ex A. Gray: JAPONIA, Honshu, Niigata Pref., Gosen-shi (Nakakanbara-gun), 2.VI.1912, leg. K. Yoshino (TSH, sine num.).*

Etymology: the name refers to the host species.

Sori in ovaries, scattered in the inflorescence, as subglobose or ovoid, black, hard bodies, 1.8–2 mm long, when young covered by a thin membrane, later becoming exposed; spore mass of the mature sori powdery on the surface. Spores flattened, in plane view moderately irregular, sometimes suborbicular or broadly elliptical in outline, in plane view 19–26 × 16.5–23 (22.3±1.5 × 19.3±1.5) µm (n = 150), in side view 11.5–14 µm thick, middle to dark reddish brown, wall slightly unevenly thickened, 1.5–2.5 (–3.3) µm thick, without internal swellings, sometimes with one, without light-refractive spots; verruculose. In SEM warts often forming small groups or short rows; the wall between the warts finely and irregularly punctate. Spore germination unknown.

Distribution — On *Cyperaceae: Carex* – subgen. *Carex,* sect. *Anomalae: Carex dispalata,* Asia (Japan – Honshu).

Comments — Based on Egorova (1999), *Carex dispalata* is a representative of sect. *Anomalae* sensu lato, which includes some smaller sections, described by Japanese authors (e.g., *Glaucaeformes* Ohwi, *Molliculae* Ohwi, *Confertiflorae* Franch. ex Ohwi, *Dispalatae* Ohwi, *Alliiformes* Akiyama). In a recently published monograph of China (Dai et al. 2010), *Carex dispalata* is included in sect. *Confertiflorae. Carex dispalata* is distributed in the Far East of Russia, Sakhalin Island, south Kuril Islands, Japan, Korea, and NE and Central China.

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